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ABSTRACT

A national survey identified the extent of computer technology use in adult literacy programs and explored the attitudes, beliefs, and experiences of adult literacy providers in implementing technology. It also conducted a systematic inventory of the types of computer technology currently in use in adult literacy programs. In recent years, a number of studies had suggested that the expansion of computer technology in adult literacy programs was essential to meet the adult literacy needs of the nation. Of 1,633 surveys that were mailed, 515 responses were received from California, North Carolina, Pennsylvania, New York, Illinois, and Delaware. Findings indicated that many adult literacy programs had a firm foothold in technology, using it for administrative, instructional, assessment, and networking purposes. Although there was still resistance and questioning about the effectiveness of using technology among some providers, the overall level of interest in using technology was extremely high. The majority of survey respondents had come to view the use of technology as an opportunity rather than as an imposition and were interested in expanding its use. The survey also concluded there were major issues of access to technology, technology funding, and staff expertise that must be addressed to accomplish any significant expansion of technology in adult literacy. (Appendixes contain 33 references, 38 data tables, and 9 figures.) (YLB)

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Technology and Adult Literacy: Findings From a Survey on Technology Use in Adult Literacy Programs

Christopher E. Hopey
Joyce Harvey-Morgan
R. Karl Rethemeyer

National Center on Adult Literacy

NCAL Technical Report TR96-12
September 1996

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Technology and Adult Literacy: Findings From a Survey on Technology Use in Adult Literacy Programs

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National Center on Adult Literacy

Abstract

In recent years, a number of studies have suggested that the use and expansion of computer technology in adult literacy programs is essential in order to meet the adult literacy needs of this country. This report adds to those conclusions by presenting the findings of a national survey on technology use in adult literacy programs. The survey, conducted in 1994–5, indicates that many adult literacy programs have a firm foothold in technology, using it for administrative, instructional, assessment, and/or networking purposes. While there is still resistance and questioning about the effectiveness of using technology among some providers, the overall level of interest in using technology is extremely high. The majority of survey respondents have come to view the use of technology as an opportunity rather than as an imposition and are interested in expanding their use. The survey also concluded there are major issues of access to technology, technology funding, and staff expertise that must be addressed in order to accomplish any significant expansion of technology in adult literacy.

Introduction

This report presents the findings of a survey on technology use in adult literacy programs. The survey was conducted by the National Center on Adult Literacy in the Spring and Summer of 1994. The goals of the survey were (a) to identify the extent of computer technology use in adult literacy programs; (b) to better understand the attitudes, beliefs, and experiences of adult literacy providers in implementing technology; and (c) to conduct a systematic inventory of the types of computer technology currently in use in adult literacy programs.

Throughout this report, the term *technology* is broadly defined to include computers and auxiliary equipment such as CD-ROMs, printers, VCRs, and audio tape players. However, the primary focus of the survey was the use of computer technology. The term *program* throughout this report refers to the administrative entity that is responsible for the delivery of adult literacy instruction. A program may be an entire organization or a small unit within an organization.

The report is broken into six sections. The first section provides background information, information on the survey design and implementation, and a profile of the survey respondents. The second section examines the extent of computer technology use in adult literacy programs. It includes a discussion of how widespread the use is, the hardware and software used by programs, how the technology is being used, who has access to the technology, and why programs are using technology. The third section discusses the obstacles that inhibit the use of technology in adult literacy programs. These include the lack of adequate financial resources, training and staff support, and appropriate software. The fourth section sets forth conclusions and the fifth setion describes future issues and possibilities as seen by the survey respondents. The sixth and last section outlines a set of recommendations for improving and expanding the use of technology in adult literacy programs.

Survey Information

Background for the Survey

"Today's technology offers enormous potential for substantially changing the field of adult literacy."
Adult Literacy and New Technologies: Tools for a Lifetime, 1993

In recent years, a number of studies, including the Office of Technology Assessment's *Adult Literacy and New Technologies: Tools for a Lifetime* (U.S. Congress, 1993) and Turner's *Literacy and Machines: An Overview of the Use of Technology in Adult Literacy Programs* (1993), suggested that the use and expansion of computer technology in adult literacy programs is essential in order to meet the adult literacy needs of this country. These studies describe in detail the potential that technology offers the field of adult literacy for reaching new and underserved groups of students, providing effective instruction, and streamlining program management and communication systems.

Although previous research on the topic of adult literacy and technology is limited, most of the existing research either promotes technology and adult literacy in terms of the benefits of technology for adult learners or it examines the programmatic and policy barriers to its expanded use. Professionals and researchers in adult literacy have been promoting the use of computers for literacy instruction since the early 1980s—Nickse (1981), Duffy and Bowen (1986), Askov (1985, 1989, 1991), and Turner (1988a, 1988b, 1991, 1993). More recent research by Hopey and Harvey-

Morgan (1995a, 1995b), Hopey, Rethemeyer, and Elmore (1995), Rethemeyer (1995), Fleishman (1993), Chisman (1990), United States Congress (1993), Massachusetts Software Control, (1994) and Anderson (1993) have addressed some of the programmatic and policy obstacles that inhibit the use of technology in the adult literacy field.

Those obstacles include inadequate funding, limited staff training, the lack of easily accessible information about technology evaluation and implementation, and resistant attitudes among some educators. As a result, a large percentage of literacy programs are underutilizing the potential of technology (U.S. Congress, 1993). However, a few adult literacy programs are notable examples of how technology should and could be used in adult literacy programs. Among these are the Ronald Hubbs Adult Education Center in Saint Paul, Minnesota; Piedmont Community College in North Carolina; and the Brooklyn Public Library in Brooklyn, New York. The commonalities among these programs are that they have overcome many of the barriers that are inherent to the field of adult literacy, such as the lack of financial support, reliance on volunteers and part-time employees, and the patchwork nature of the adult literacy service delivery system. In addition, they are using technology to push the instructional paradigm beyond traditional models, using technology not as an "add-on" but as a revolutionary set of instructional tools that allow for greater privacy, control, individualization, feedback, and flexibility (Anderson, 1991; Askov, 1985, 1991; Turner, 1988a, 1988b, 1991, 1993). Much of the current research literature promotes these five benefits of technology for the field of adult literacy.

The privacy afforded by technology allows adult learners to participate cooperatively in the educational process when and if they choose to do so (Turner, 1991, 1993). Berterreix (1990) argues that technology frees knowledge from its usual emotional context and negative prior associations for adult learners and eliminates some of the fear of ridicule and the reality of discrimination that they experience when learning.

Technology puts the learner, not the teacher, in control of the learning process, enabling learners to make decisions about what and how they will learn (Anderson, 1991; Turner, 1993). Technology allows the adult learner the opportunity to become the architect of his or her own educational plan, with assistance provided by the teacher or tutor (Turner, 1993).

The ability to individualize instruction for a single learner's needs is for many one of the greatest benefits of technology (Turner, 1993). New technologies such as multimedia and interactive software allow instruction to be individualized in terms of both achievement level and the specific interests and abilities of learners (Turner, 1993). Materials can be developed, altered, and tailored to the needs of individual learners in ways that are not possible with textbooks and workbooks.

Immediate feedback is considered to be one of the most important benefits of instructional technology for adult learners (Anderson, 1991; Guellette, 1982; Sivin-Kachala & Bialo, 1992). The ability to receive immediate feedback in computer-based instruction is of considerable benefit for the learning process—providing valuable information to the learner, increasing motivation, and enhancing retention in learning activities (Anderson, 1991; Guellette, 1982; Sivin-Kachala & Bialo, 1992; Turner, 1993).

With the development of the Internet and hypertext tools, technology makes available a new level of flexibility. While the field has not begun to realize this potential, instruction could now be made available 24 hours a day, at any time or any place. In adult literacy programs, matching learners to tutors and classroom schedules has proven to be a real challenge. Instruction occurs only as long as the tutor and learner can get together at a single location. Given the complex and difficult lives of most adult literacy students, flexible instruction would

allow more adult learners to participate. The delivery of instruction in a variety of settings, including learning labs, libraries, homes, and offices, is just beginning for adult literacy. The capability of fiber optics and computer networks to deliver instruction 24 hours a day is no longer just a vision.

The development of new low-cost instructional materials for television and computers also increases access and flexibility. An example is the KET GED series, which has been revised, updated, and repurposed for video and interactive video and continues to be delivered on broadcast television as well as cable (KET, 1992). The advent of video for home use has created another inexpensive avenue for distribution of materials originally developed for television broadcast.

The popularity, low cost, and quality of multimedia, with its ability to offer sound, full motion video, and interactivity, are helping to increase its appeal for many literacy programs (Lovell, 1993; Turner, 1993). Purchase of peripherals can transform existing stand-alone computers into powerful multimedia systems. As technologies converge and merge, the differences between hardware and software begin to blur. Although we are not at the point where all technologies are interchangeable, it becomes increasingly apparent that literacy providers have many more low-cost powerful options for instructional delivery.

As Turner (1993) states, "the ability to organize information in multiple formats is finding its way into adult literacy through hypermedia, hypertext, and the Internet. Information that is organized by associative relationships is the basis for programs like HyperCard and most recently the World Wide Web." According to Bill Gates, "People don't think and learn in a straight line, from one fact to another; they go off on a million tangents, because they're interested in a million things" (Blanchard, 1990). Interactive and multimedia software is allowing adult learners the opportunity to explore databases and access information in a way that enables them to form their own learning on the basis of personal interests, goals, and associations. The future curriculum will be constructed by each learner through the conversion of information to create meaning that is personalized and learner specific, in other words learners will in essence author their own learning (D'Ignazio, 1992).

However, moving to a 24-hours-a-day adult literacy instructional system is still years away. The current state of adult literacy and technology is one of flux (NCAL, 1995; Turner, 1993). The lack of adequate funding has prohibited many adult literacy programs from realizing the potential of technology in their programs. Certain policy constraints have prohibited many literacy providers from purchasing computers. A recent study indicated that the need for funding for hardware purchases was widespread among literacy organizations. Adequate funding was the single biggest reason adult literacy programs lack technology (Sivin-Kachala & Bialo, 1992).

Nonetheless, even if those barriers were eliminated, technology may still not expand to the levels experienced by other sectors of education because of the general nature and history of adult education in the United States. Turner (1993) concluded:

> Despite the fact that technology is now viewed as an accepted part of society and education for children, the use of computers for adults has continued to meet some resistance. This resistance to technology by adult educators has been attributed to the sharp contrast between the underlying philosophy of adult education and that of computer instruction. The field of adult education is highly humanistic and process oriented, emphasizing internally driven goals and objectives (Cross, 1988; Knowles, 1973). This is in sharp contrast to the behavioral approach used by many software development companies in their software products. The product orientation and

competency-based skill development of most software programs of the past have been rejected by many adult educators (Meierhenry, 1982; Vacc, 1984). The work of Paulo Freire, Malcolm Knowles, and other noted adult educators focuses on the whole person and the total learning environment and emphasizes a holistic, or gestalt, approach to instruction. Thus, technology as a means of instruction that does not embrace the whole person has been viewed as suspect by more traditional literacy programs.

However, with the advent of multimedia, interactive software, and the Internet in the 1990s, the situation is changing. Many adult educators who had rejected technology in the 1970s and 1980s are now taking another look at the use of technology for adult literacy instruction (Turner, 1993). More recent work by Hopey and Harvey-Morgan (1995a, 1995b), Hopey, Rethemeyer, and Elmore (1995), Rethemeyer (1995), Fleishman (1993) and Anderson (1991) has directly addressed some of the immediate issues of technology use in adult literacy such as technology planning, implementation, fund-raising, software development and evaluation, and use of the Internet.

The use of technology in the field of adult literacy still has a long way to go. We need more information about the actual extent of technology use within programs, the purpose(s) for that use, the types of technology currently in use, and the attitudes and beliefs of providers—both those that encourage and those that discourage technology use. In order to gain a more complete profile of the use of technology in the adult literacy field, the National Center on Adult Literacy (NCAL) conducted the National Survey of Computer Technology Use in Adult Literacy Programs.

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Survey Design and Implementation

A survey instrument was designed that would gather information on the extent of computer technology use in adult literacy programs and the experiences, attitudes, and beliefs of adult literacy practitioners about computer technology use. A number of other survey instruments were reviewed. The Bank Street College (1993) survey of telecommunications usage in elementary and secondary education proved to be particularly instructive. A preliminary survey was developed and pilot-tested with 30 adult literacy programs. The pilot instrument was modified, and the final 17-page survey instrument was completed.

NCAL sought to survey a broad cross-section of adult literacy providers, because of the diversity of programs that result from different types of administrative entities and funding sources. Six states were selected for participation in the survey—California, Illinois, New York, North Carolina, Delaware, and Pennsylvania. These states provide a representative sample of the country. They are geographically diverse, include the diversity of student populations found nationwide, provide adult literacy programming through a mixture of funding and administrative agencies, and have well established adult literacy infrastructures.

Adult literacy programs were identified in each state by gathering databases from the six state directors of adult literacy, directors of state prisons, Literacy Volunteers of America, Laubach Literacy, local literacy commissions, and non-profit associations, as well as using NCAL's database of practitioners. These databases were reviewed and a list of 1,633 programs developed. These 1,633 surveys were mailed in the Spring of 1994. Reminder letters and postcards were sent out twice to improve the survey's response rate such that all data collection was completed and analyses undertaken took place in 1995.

Profile of Survey Respondents

The results presented in this report are based on the responses of 515 programs (a 31.54% response rate). Of the 515 surveys returned, 27% were from California, 26% from North Carolina, 19% from Pennsylvania, 12% from New York, 12% from Illinois, and 4% from Delaware (Table 2, Appendix). The research design and the low response rate of the survey has consequences on the findings. The findings in this study may be limited to the immediate sample being tested thus they may only be suggestive rather than predictive of the field of adult literacy. However, the programs represented by the 515 respondents appear to match fairly closely the population of adult literacy programs in the United States. They represent a cross-section of organizational types and target populations. When the demographic profile of the sample is compared to other more comprehensive studies such as the *National Evaluation of Adult Literacy Programs* (Young, Morgan, Fitzgerald, & Fleischman, 1994), the sample is comparable in terms of the number of students served per program, number of employees, and budget sizes.

It is also important to note that the results of the survey may be skewed toward programs that use technology. It may be that less technologically sophisticated organizations found the instrument difficult and time-consuming to complete and therefore discarded it. However, once again the sample seems to be comparable to literacy programs in general. Thirty-three percent of the programs are administered by public schools or school districts, 18% by community-based organizations, 17% by community colleges, and the remainder (8%) by labor unions, hospitals, homeless shelters, public housing agencies, or other organizations. Seventy-seven percent of the programs in the sample offer literacy instruction at more than one location.

The largest group of respondents (34%) represent programs located in cities with a population between 25,000 and 100,000, 23% represent programs from urban or metropolitan areas of more than 250,000 people, 17% represent cities between 100,000 and 250,000, and 26% represent programs located in small towns and rural areas.

The programs in the sample serve from 6 to 100,000 students per year. The average number of students served per year by a program was 1,370. The programs in the sample serve a wide range of populations, including ABE, GED, ESL, family literacy, and workplace literacy. Seventy-four percent offer ABE instruction, 66% offer pre-GED instruction, 59% offer GED instruction, 67% offer ESL instruction, and 25% offer family literacy instruction. ESL programs had the highest average number of students per program (777.9 per year), while ABE programs served an average of 183.2 students per year and GED programs served an average of 347.8 students per year.

The majority of programs responding to the survey had an annual program budget of less than $100,000. Forty-three percent had an annual budget under $50,000, and another 16% had an annual budget between $50,000 and $100,000. Only 10% had a budget greater than $500,000, and 18% had an annual budget between $200,000 and $500,000.

The majority of programs relied heavily on part-time and volunteer staff. While the average number of instructors per program was 15.8, the average number of full-time instructors was only 1.9 per program as compared to an average of 12.8 part-time instructors per program. Most programs rely heavily on volunteer tutors, with the average number being 46.8 per program. One program had more than 1,000 tutors. The number of administrators varied from one part-time administrator to more than ten full-time administrators at a few large community colleges. The average number of full-time salaried administrators was 1.3 per program, and the average number of part-time salaried administrators was 1.1 per program.

Extent of Computer Technology Use in Adult Literacy Programs

How Widespread Is the Use?

The generally held belief in the adult literacy field is that technology use has been limited. Most frequently cited factors for this limited use were lack of funds and lack of knowledge about using the technology. The survey results paint a slightly different picture. In fact, use of computer technology is quite extensive among programs, with a significant majority of them making some use of computers and most programs using computer technology for a range of activities. However, as we start to consider just how extensive this use actually is, we find that it is quite limited in terms of what technology is being used, how much technology there is within programs, who uses the technology, and how much access students actually have. One of the most optimistic findings of the survey is the very strong interest in computer technology expressed by the respondents. A significant percentage (64%), both those currently using technology and those who are not, are interested in expanding their use of technology.

The large majority of respondents (79%) reported that they use technology, with that use ranging from limited to significant. Twenty-one percent of respondents do not currently use computer technology, but only 7% indicated they had no plans or desire to do so. The rest (14%) would like to use technology in the near future. A little less than a quarter of the sample (23%) reported significant use of computer technology. Half of the programs use computers on a limited basis but are seeking to expand their use in the near future (Table 9, Appendix).

Not surprisingly, there is a positive relationship between budget size and use of computer technology. All of the programs with a budget greater than $200,000 use computer technology, while 36% of the programs with a budget under $50,000 reported no use of computer technology (Table 11, Appendix).

There is also a positive relationship between type of organization and use of computer technology. Of the different types of organizations, 24% of literacy volunteer organizations do not use computers and do not plan to as compared to only 2% of community colleges and 3% of public schools (Table 10, Appendix). Literacy volunteer organizations tend to have much smaller budgets than programs administered by community colleges or schools districts. In addition, larger, multi-purpose organizations also have the advantage of economy of scale. Many types of computer technology require a large fixed investment to acquire even a minimal capacity, but once the fixed investment is made, the variable cost of use is relatively small and the investment can be utilized by a large number of users. Thus, adult literacy programs located within larger multi-purpose organizations are generally able to take advantage of and leverage other technology resources within their organizations.

How Is the Technology Being Used?

Adult literacy programs in the sample are using computer technology for a wide range of purposes and activities. A majority of programs in the sample (82%) use computer technology for administrative activities (e.g., letter/report writing, record keeping, and/or data collection), 67% use computers for instruction (either classroom instruction or tutoring), 31% for assessment (e.g., testing, advising, and/or placement), and 26% for networking (e.g., e-mail, modem access, or file sharing; Table 12, Appendix).

This use varies among programs, according to organizational type and budget size. For example, only 44% of literacy volunteer organizations and 52% of community-based organiza-

tions use computers for instructional activities, while 88% of community college programs and 76% of public school programs do so (Table 13, Appendix). Budget size is positively correlated with use of computers for instruction, with 87% of programs that have budgets between $100,000 and $200,000 using computer technology for instruction but only 46% of those with budgets under $50,000 doing so (Table 14, Appendix).

Over one third of the programs that use technology (37%) use a local area computer network (LAN), and 30% use an on-line network service. The most common uses for LANs are e-mail (62%), student record keeping (58%), and instruction (37%; Table 28, Appendix). The most common on-line services used are OTAN (38%; Because OTAN is an on-line adult literacy 353 project administered in California and targeted to adult literacy programs in the state, and considering the survey was administered in only six states, including California, this figure is certainly skewed and is not representative of the country as a whole.), America On-Line (31%), and direct Internet access (26%). The most common uses for on-line services are e-mail (68%) and bulletin board access (48%; Table 30, Appendix).

The survey results suggest that programs using computer networks usually have a larger budget and are administered by a larger organization such as a community college or public school. More than two thirds of adult literacy programs that have a budget over $1,000,000 use computers for electronic networking. By comparison, only 16% of the programs with budgets of less than $50,000 used computer networks. Thirty-seven percent of community colleges and 29% of public schools use computers for networking as compared to 16% of community-based organizations (Table 13, Appendix).

What Technology Is Being Used?

Hardware

Although the majority of adult literacy programs are using computer technology for both administrative and instructional purposes, when we consider the type of computers being used, serious issues emerge. The data suggest that adult literacy programs are generally relying on trailing-edge technology, with the exception of those programs with large budgets or access to other organizational resources.

The average number of computers per program varies by computer type. IBM or IBM-compatible 386/486 model types had the highest average (12.2) per program followed by IBM or IBM-compatible PC or PC jr. (11.7) per program. The lowest average was for Apple Macintosh Centris and Quadra computers (2.3) per program. However, these numbers are misleading, and we should not equate numbers with access. A few very large labs in the sample have tended to skew the averages upwards. In addition, there is no data available on what specific machines are being used for, or which unit within an organization controls their access. In many cases, multi-purpose organizations reported their institutional resources without noting whether their literacy programs had access to the resource. Some noted that the large labs are not under the control of the adult literacy program and that access to those labs is controlled by other units within the organization.

The following data help to clarify the serious deficiencies in the computer capabilities of the current infrastructure. Eighty percent of programs have at least one IBM-compatible personal computer, 64% have at least one Apple computer, and 48% have a combination of IBM and Apple computers. However, when these numbers are disaggregated by model and type of computer, the deficiencies in capability become apparent. Almost half (47%) are using Apple II machines, and 42% are using low-end IBM PC machines. When these figures are cross tabulated, it becomes clear that 57% of programs use only low-end computers (Apple IIe or Macintosh SE and/or an IBM-PC/PC jr./XT/AT machine).

While these computers certainly have a role to play in literacy programs, it is important to keep in mind the limitations implicit in older computers. First, most of the computers found in adult literacy programs do not run current operating systems, such as Microsoft Windows95™, IBM OS/2™, or Apple Macintosh System 7™. (It is, of course, possible to use these computers for teaching general computing and keyboarding skills and also for teaching writing skills, so they do provide some value.) Second, most low-end computers cannot support sound or graphics, and those that can usually lack the memory or hard drive space needed to support multimedia applications. This is particularly important because much of the more advanced multimedia software coming onto the market incorporates digitized sound, digitized images, and a graphical user interface. However, this does not imply that older drill and practice software programs are less effective than more current computer-assisted instruction (CAI) applications. It only implies that the more technologically innovative and multimedia problem-solving software products are not being used in literacy programs because the hardware platforms presently in programs do not allow for it. Third, many of these computers have reached or are near the end of their expected life. Although there is no data available on the rate of machine failure, it seems likely that between one quarter and one third of the current computer infrastructure will need to be replaced soon because of simple machine failure. Adult literacy programs will need to acquire more powerful machines at a faster rate just to maintain their ability to purchase the multimedia software currently available, much less to expand their resources. And finally, the computer skills that learners develop if they just use low-end computers are not directly applicable to work situations because they are not the operating systems found in most offices.

When one examines the data on computer peripherals, these trends are also confirmed. Many programs are embracing newer technologies like CD-ROMs and laser discs. The most heavily used new technologies are high resolution color monitors (29%), CD-ROM drives (26%), modems (22%), scanners (12%), digital sound tools (12%), and video laser discs (11%). However, these peripherals are concentrated in the same programs that have access to high level computers (Table 33, Appendix).

Software

Adult literacy practitioners use a variety of software packages for reading, writing, math, and other instructional areas. The vast majority of survey respondents who are using computer technology (80%) use drill and practice instructional software packages. Frequency of use of other types of instructional software packages includes the following: 70% use tutorials, 64% use educational games, 47% use problem-solving software, and 26% use digitized speech software.

A relatively low percentage use the new types of software like multimedia (14%) or interactive courseware (22%; Table 17, Appendix). As mentioned earlier, one of the primary reasons why so few programs use multimedia software is that most do not have the equipment necessary to run such software.

While packaged and stand-alone systems are used by a majority of the programs, 13% of technology users also use an integrated learning system (ILS) for instructional activities. Although more than a dozen different ILSs were being used by the 51 programs that use them, the most common ILS products include the Computer Curriculum Corporation's Integrated Learning System (31%) and the Roach Organization's Plato (12%).

To overcome perceived deficiencies in product offerings, many practitioners and programs are experimenting with hybrid software solutions. Some use a suite of small programs that are woven together in a curriculum. Others are using different types of productivity or business application software for instructional purposes. Seventy percent of those using computer tech-

nology use word processing software, 20% use database software, 20% use spreadsheet software, and 18% use desktop publishing software—all for instructional activities. These packages rely heavily on program-developed curricula and instructional approaches.

Who Has Access to the Technology?

Student access to computer instruction is often problematic because few programs have enough computers or trained staff to accommodate the demand for computer-based/computer-assisted instruction. Even when students have access to a computer or computer lab, the number of contact hours with the computer is actually quite small. In many instances, the programs have not integrated technology into the curriculum very well, leading to instructional limitations on computer use (e.g., the student may have unlimited access to the lab, but the computer component of the curriculum takes only 20 minutes to complete). Finally, many instructors and administrators still do not view the use of computers as an essential component of adult literacy instruction and consequently do not make the resources available to students.

Adult literacy students in the survey sample had very little access to computers. Only 3% of the programs offer computer-assisted instruction for 10 or more hours per week. About a third of the programs that use computer technology (37%) provide computer-assisted instruction one hour or less a week, and 51% offer between two and five hours of computer-assisted instruction per week. Not surprisingly, the number of hours students have access to computers is related to the type of organization and program's budget size. Fifty-three percent of the community-based organizations offer one or fewer hours a week of computer-assisted instruction, whereas only 24% of community colleges offer fewer than 1 hour of computer-assisted instruction per week (Table 20, Appendix).

The survey results indicate that more than half of the programs in the sample (60%) provide computer-assisted instruction to 25% or less of their students; only 16% provide computer-assisted instruction to 75% or more of their students. Access is also an issue among different student population groups. Forty-five percent of the programs that offer GED instruction provide computer access for their students, 38% of programs offering ABE instruction provide computer access, and only 29% of programs offering ESL instruction offer computer access (Table 22, Appendix).

Allowing students access to computers outside of regularly scheduled instructional hours is one way to improve access to computers. Approximately one half of the programs that use technology (47%) allow students access to computers outside regularly scheduled instructional hours.

Why Are Programs Using Computer Technology?

Use of computer technology for administrative purposes is widely accepted and practiced. The only limitations to such use seem to be a matter of resource allocation and acquisition. However, many factors seem to influence the use (or non-use) of computer technology for instructional purposes. The attitudes and beliefs of practitioners toward the use of technology play a significant role. Survey respondents were asked their perceptions about the advantages of using computer technology for instructional purposes. The list of statements for respondents to react to (Table 16, Appendix) was compiled from various sources, including the OTA report and Turner's report on literacy and technology (Turner, 1993; U.S. Congress, 1993). Those factors ranked the highest focused on learner-centered issues. The top five advantages cited, all rated within a narrow range, were (a) immediate feedback is provided to students, (b) greater learning incentives are provided to students, (c) non-threatening feedback is provided to students, (d) students can learn at their own pace, and (e) students can have greater control over their learning. Improved quality of instruction, improved student retention, and improved student recruitment and participation were all cited as important but not as important as the previous group of factors.

Interestingly, although there is much discussion about the potential of technology to break through geographic and time barriers and to reach learners in any place and at any time (U. S. Congress, 1993), respondents rated increasing access to instruction by remote methods as the least important advantage of using technology.

Obstacles to Expansion of Computer Technology Use

There is a gap between the current extent of technology use in the adult literacy field and the level of interest in using technology. Many real and perceived obstacles affect use, both for programs that currently use no technology and for those that use technology but would like to further expand its use. The Office of Technology Assessment study (U.S. Congress, 1993) cited the following four barriers to technology use: inadequate funding, lack of appropriate/effective instructional software, lack of information on technology options in adult literacy, and institutional barriers/resistance/incapacity to implement technology solutions. The results of the NCAL survey confirm some of these hypotheses, identify other obstacles, and suggest that the issues are more complex than originally thought.

Lack of adequate financial resources is perceived to be the greatest and most persistent obstacle to expanded use of technology in adult literacy programs. Closely tied to this obstacle are the restrictions on the purchase of technology within some federal and/or state policies. Other obstacles perceived as significant are (a) the lack of adequate training for staff/instructors, (b) the lack of time for staff to learn how to use the technology, (c) the need for additional staff, (d) the lack of adequate information about using computers, and (e) the lack of appropriate software. Additional obstacles among non-users of technology are resistance to using computers and the belief that traditional methods of instruction are more effective.

Financial Resources

For the average adult literacy program, financial resources for regular instructional programming are limited. There are rarely any resources left over for innovation in an expensive and uncertain area such as technology. Providers constantly struggle with funding issues.

The range of spending on hardware and software varies greatly among types of providers. While a few large community college systems spend more than $50,000 dollars a year on technology (hardware, and software), the majority of programs appear to have no budget for purchases of hardware (63%) or software (56%). Many programs scrape together funds for software purchases out of supplies budget lines. Only 29% of the entire sample indicated that they had purchased $100 or more of computer hardware in the previous year. With computer systems averaging between $3,000 and $5,000, the potential rate of computer acquisition in adult literacy programs is not promising. In fact, the rate of replacement will not keep up with the obsolescence problems outlined previously.

Adult literacy programs do, however, make an effort to tap into outside resources to purchase computer technology. Fifty-one percent of programs that use technology seek additional funds over regular program funds for technology purchases. The most frequently tapped sources of funding are state and local grants (54%), federal grants (43%), donations from corporations (24%), private foundations (18%), and fund-raising events (17%) (Table 35, Appendix).

Training and Support for Staff

Many programs (57%) provide some type of technology training. Yet, lack of adequate training and lack of time to learn about technology were cited as two major obstacles to increasing the use of technology. A majority of the training provided (91%) is seminar/ lecture format, while only 8% is hands-on training (Table 26, Appendix). The programs utilize training from a combination of sources: 73% use training provided by internal staff members, 41% use training provided by product vendors, 37% use outside trainers or consultants, and less than 3% use a local college or university.

The findings also suggest that formal training is related to the program's budget size and type of organization. For example, a majority of public schools (65%) and community colleges (61%) offer formal technology training. Substantially fewer community-based organizations (42%) and literacy volunteer agencies (43%) provide regular training. Forty-nine percent of the programs with a budget under $50,000 provide formal training as compared to 83% of those programs with a budget over $1,000,000 (Table 27, Appendix).

In spite of the involvement of many programs in technology training, many others clearly have little or no access to such training. It seems apparent from the survey results that what is being provided is not enough and is inadequate to meet the needs of adult literacy practitioners. The extremely low emphasis on hands-on training is a crucial issue as well.

The time required for learning about the technology is another very important obstacle. Because, as we've noted, the majority of the practitioners in the adult literacy field are either part-time employees or volunteers, time is at a particular premium.

Many adult literacy programs also struggle with the technical know-how/technical assistance required to install and operate the hardware or a particular piece of software. Many programs use a combination of technical expertise to support and maintain the technology they have. For example, of the technology users, 22% make some use of outside consultants and 31% use a full-time member of their own staff to provide technical support. However, many small organizations cannot afford this kind of technical assistance and staff support.

Computer Software

A large number of respondents were critical of adult literacy software, in terms of both its quality and relevance to adults. Many feel that the content one can deliver on computers to adult literacy students is not worth the additional time and effort necessary to raise funds for computer technology. The following comments were typical:

> [We need] software that moves beyond drill/practice. We need software that is interactive, encourages critical thinking, allows for group learning, and can be integrated into classroom instruction.

> There is a definite need for appropriate software in the field of literacy. Currently much of the software available is condescending and inappropriate not only in content but also in graphics. Interactive programs, adult level material, and better sound capacity would be at the top of my list.

> [We need] software that better reflects the reality of adult literacy learners. Software written with adult interests in mind is difficult to find, especially at the low reading levels. Many of the skills taught by software do not reach the life skills needed by adults (paying bills, writing checks, etc.).

Nearly 10% of respondents have developed their own software because they could not find any that was relevant, of high enough quality, and/or affordable (Figure 3, Appendix).

While hybrid and productivity-based software solutions offer promise for the future, most programs lack the human or financial resources needed to develop innovative computer-enhanced curricula. Program managers and practitioners want off-the-shelf packages that can be plugged into their instructional programs immediately. Thus far, vendors have not provided these types of solutions. Until they do or until program capacity for innovation has been enhanced, it is likely that software deficiencies may restrict the use of computers for instruction in adult literacy programs.

Conclusions

The survey results clearly indicate that many adult literacy programs have a firm foothold in technology, using it for administrative, instructional, assessment, and/or networking purposes. While there is still resistance and questioning about the effectiveness of using technology among some providers, the overall level of interest in using technology is extremely high. The majority of survey respondents have come to view the use of technology as an opportunity rather than as an imposition and are interested in expanding their use. It is equally clear, however, that there are major issues of access—at both the program and student levels—and of staff expertise that must be addressed in order to accomplish any significant expansion of technology implementation.

The issue of access must be addressed from several perspectives. The vast majority of programs, large and small, in all different types of settings, are unable to provide their students with adequate access to technology. The inadequate amount of technology available means that most students who do have access have a limited amount of time to use the technology and that many students have no access whatsoever. Few students have access to anything approaching the latest technology, as far too many adult literacy programs are relying on older low-end computers that do not have the capacity to use current software, multimedia, and communications tools.

The lack of adequate financial resources is a formidable obstacle among all types of programs and for both current users and non-users of computer technology. While many programs are reasonably able to address their administrative needs, most do not have the funds to purchase the hardware and software needed to provide their students with adequate computer access.

The other major issue for the expansion of technology use in the adult literacy field is the level of staff expertise. As the survey results indicate, lack of adequate training, lack of adequate information about computer technology, and lack of adequate information on effective uses of technology are all impediments for practitioners. There is clearly a major need for staff development—high quality, multi-content, hands-on, and ongoing. Just as with the issue of funding, there are no easy answers to the issue of training. However, a number of steps should be taken.

As of the time of this survey in 1994–95, a sizable number of adult literacy providers were using on-line communications and electronic networking, yet the majority were not. Access to on-line resources and to the Internet has become increasingly easy and relatively low-cost. Many of those practitioners who were not connected actually had the necessary equipment, but lacked the awareness of just how accessible the on-line services were. In the 2–3 years since this study was undertaken, much has changed, especially in access to telecommunications; NCAL is currently conducting another survey (in 1997) to update these data. These technologies hold enormous promise for the future—for lessening the isolation that many adult literacy providers and students experi-

ence, for increasing the communication between staff and students within and between programs, for increasing access to high quality materials and current resources and information, for streamlining administrative and reporting processes, for developing a centralized "clearinghouse" of information and resources, and for exploring innovative instructional and staff development approaches.

Moving Into the Future

Survey respondents were clear about what technology they would purchase if they had additional funds. The majority focused on the expansion of hardware and software capabilities. For many, this included the purchase of multimedia hardware with CD-ROM and videodisc capability. Also mentioned frequently was the expansion of networking capabilities.

When asked about what technology they would like to see in the future and what areas of technology needed to improve in order for technology use to increase, the majority of respondents focused more on gaining greater access to existing technology. Several suggested that new developments are not the issue, but that the most important issue is access to hardware, software, and quality training.

A number of respondents indicated that what is needed in the future is a change of orientation and approach to the use of computer technology. In addition to using the technology as a means to deliver instruction, they cited a need to re-focus the field on teaching computer use as a necessary type of literacy. Providers are beginning to recognize that students are not being adequately served unless they are provided with current technology skills.

- Technological literacy will become as crucial as language literacy. Access to information will largely depend on the ability to use new technologies.
- Technology skills are becoming] increasingly important as computer literacy becomes a minimum requirement for most jobs.
- ...a paradigm change in the delivery of education to integrate technology into the curriculum...a demand for more use of technology for adult learners, as younger, more technologically able employers freeze them out of the job market.
- Computers should be an integral part of every adult literacy program....In a world where computers have become more of a necessity than a luxury, it is imperative to get them into classrooms of adult literacy students.
- The use of on-line computer networks will be very important in the workplace and daily life in the future. We should prepare our adult students for this.

The majority of those who were able to focus on new developments emphasized the need for better instructional software—software that is adult-oriented, relevant to the lives of adults, developmentally appropriate, culturally sensitive, and available at an affordable price. It should utilize varied and pedagogically sound instructional approaches, move beyond drill and practice, integrate problem solving and critical thinking into literacy instruction, and provide immediate feedback to the student. Practitioners are quite specific about what is needed.

- ...really good software that is easy to use but challenging in content.
- ...interactive multi-media software that challenges, instructs, and reinforces reading, spelling, writing skills...that allows students to hear or see their successes and errors

and that can specifically explain solutions and their rationale...that tracks the student's weak spots and reinforces new skills in those areas.

- ...easy to use, has clear speech, and can read any word on the screen...reading programs made for hard drives that follow sequential steps and cover all aspects of reading development (letter recognition, letter sounds, sight words, comprehension). The program should be able to be used by students without teacher assistance and should automatically spot areas of weakness (common mistakes) and remediate.

- Software that takes the medium and the students into consideration. With the development of faster processors, machines will be able to make use of multimedia capabilities (voice, interactive assessment). Unfortunately, most adult literacy software forgets simple rules such as no more than seven lines per screen and no more than twenty words per screen. These two rules were written because of the medium, a computer screen. Hopefully the technological advance that will come about in the future is that software developers will work with their own products and realize how uninviting, unstimulating, and defeating they are to a student who is uncomfortable just sitting at a computer, let alone trying to learn from it.

Areas of need that were cited frequently were ESL software, software for low-level readers, and software that integrates voice and graphics.

- We have yet to find good comprehension software for the foreign-born adult literacy student. There is an abundance of vocabulary and grammar software, but everything on comprehension seems to be written for the native-born speaker.

- CD-ROMs with good ESL programs at all levels.

- CD-ROMs—visual and voice—development of a teaching database for ESL products that are culturally appropriate for students. Products make an impact on lives—economically. Students could use this independently or any time during the day.

As cited earlier, respondents do not view the potential of technology to reach students at a distance to be a strong current advantage for technology use. Yet, several discussed the promise distance education holds for solving the problems of student access to quality instruction and of teacher isolation. Greater use of portable computers, electronic networks, and television was cited as a needed future development.

- We are so far away from the education center at the community college and many of our students have transportation problems, being from a poor socioeconomic area. I would like to have some method or system whereby these students would have access to obtaining training through the information highway by simply turning their televisions on.

- Due to living in a rural area, linking all of our literacy sites with one another would have great advantage. This could be done using a local area network and fiber optics. This would allow us to communicate more freely and could also give students access to programs currently available on our main campus.

- Distance learning to deliver literacy instruction to rural, home-bound populations. Distance learning capability could also enable instruction to be delivered to the workplace.

- Computer usage in the future must be home-based where clients can stay home and communicate with a teacher when assistance is needed. The computer program should be made available on a 24-hour basis. Take home computers should be made

available to students who cannot attend formal GED classes. With a modem, using telephone lines, students' work results could be retrieved by the teacher without the student having to come to the site or sending in paperwork. A teacher could then assign work on the computer for the student.

Recommendations

Based on the results of this survey, as well as the findings of other technology projects conducted by NCAL and interactions with practitioners and policymakers across the country, a number of recommendations can be made for consideration and possible implementation. While there are no easy solutions to the financial dilemma, multiple steps should be taken. Policymakers at both the federal and state level, private funders, hardware and software developers, and adult literacy practitioners all have a role to play improving the financial picture. At both the federal and state policy levels, restrictions and caps on purchase of hardware and software need to be removed. Program staff need to be encouraged to increase their use of technology, not discouraged from doing so. As a part of their annual plan to be submitted to the U.S. Department of Education, states should be required to submit a technology plan, indicating what steps will be taken, and how they will be budgeted, to expand the use of technology. Incentives might be offered, at both the federal and state level, for instruction that integrates technology into the delivery system and for reconfiguring staffing patterns in ways that take advantage of the technology.

State directors of adult education might take the lead in facilitating the development of technology consortia, through which initial evaluation/review of hardware and software and purchasing (as well as technical assistance and technology training) could be consolidated, thus creating an economy of scale and reducing the resource costs—funds, time, and expertise. They should also explore the feasibility of funding and administering programs differently and the impact this would have on expanding technology use. It has already been noted that adult literacy programs administered within larger organizations such as community colleges and public schools have access to more and better technology resources and are better able to take advantage of economies of scale. Much more leveraging and maximization of resources seems possible by rethinking our current administrative methods. As an example, most public school computer labs are used only during the normal daytime instructional hours. It seems likely that significant additional educational opportunities could be provided at minimal additional cost (equipment maintenance, electricity, building supervision/security) by utilizing these labs during before-school, after-school, and evening hours. Re-thinking the allocation and administration of educational resources, while not easy to contemplate, must be done across all departments and sectors of our current system if we are to be able to provide students with the learning opportunities they need.

Adult literacy program and state administrators must become more knowledgeable about and more actively engaged in the legislative arena. There are a significant number of students and professionals engaged in the adult literacy field; yet, the voices and presence of the field in the legislative arena have been nearly silent and not well organized or well articulated. Numerous legislative bills addressing technology, educational technology, and workforce issues have been or will be considered in the near future. Technology use for education, adult literacy and adult education as well as K–12 education, should become a national priority. Unless adult literacy and adult education professionals make efforts to be heard and to become more actively involved in the legislative process, this will never occur.

Federal and state literacy budgets alone cannot provide the necessary resources. Additional resources must be sought outside the public arena from corporate, community, and

foundation sources. State directors can play a leadership and advisory role, but adult literacy program administrators must become directly involved in resource development. This is not easy given the varied and often immediate demands on their time, but it has become increasingly necessary. Program administrators should explore possible local funds, including local corporations and especially small local foundations, which are often quite plentiful in communities but may take a little work to identify and locate. While corporate funds should be sought, they can be difficult to access, especially for very small programs.

Other kinds of partnerships, beyond straight financial contributions, should be explored. Most companies of any size stay relatively current with their own computer technology. They often have used computer equipment but may not have good options for disposing of it. Many will consider donating used equipment to non-profit organizations such as adult literacy programs. There may be other kinds of mutually beneficial partnerships to be explored as well. It is important to keep in mind that potential funders and partners of all types generally are more responsive to requests that are well thought out, part of a careful technology planning process, and where outcomes are realistic and clearly articulated. When organizations can identify particular benefits to their involvement in the partnership, the odds may be even better.

Even when resources become available, they are not always used in the most efficient manner because most programs do not do continuous technology planning, and extra funding resources often become available at the end of grant cycles. In many cases, technology purchases are only made at the end of the year, when grant surpluses are identified and monies must be spent immediately. Because a plan is not in place and purchasing priorities have not been set, staff often scramble to identify hardware and software options before the clock runs out on the funding source. Wiser and more efficient expenditure of resources for technology generally occurs when these purchases are part of an ongoing planning process that includes clearly articulated goals, objectives, and priorities.

Given that funding will always be an issue, no matter what the source, new ways to leverage the existing educational computer technology resources need to be explored. As has already been noted, larger adult literacy programs and in particular those administered by multi-purpose organizations such as community colleges and public schools, have greater access to technology resources and are using technology for instructional purposes to a much greater extent than the smaller stand-alone volunteer and community-based organizations. Perhaps the current adult literacy infrastructure needs to be rethought in order to utilize the existing resources more effectively. For example, too many computer labs in public schools sit empty at night or during the weekend, when they could be utilized by adult literacy programs and students. Perhaps we need to work at opening up and breaking down the "silos" created by the separate funding streams of the educational bureaucracy. Many literacy programs could much more realistically help to support the incidental expenses such as security and janitorial staff required by sharing a facility than they could support maintaining a complete facility.

The issue of student access to computer technology is an underlying issue tied to funding and equipment purchase. Yet, the survey results showed that different population groups appear to have different degrees of access to computer technology. As already discussed, ESL students in the programs surveyed had the least access to computer technology. This may be related to the perceived deficits in the appropriateness and quality of software for ESL adult students. It may also be related to the perception that exists among many instructors that ESL (and also new readers) cannot (or should not) use the technology, that computer technology demands a level of literacy skills beyond their capabilities. However, from our experience, it appears that many instructors, perhaps those who are most comfortable with the technology themselves, are using computer technology quite effectively and creatively with the full range of students. In fact, many find that new English speakers and new readers learn quickly and gain additional confidence by having access to

the technology. The issue of student access and equity of access among different population groups needs greater attention; we must increase access for all students, for all population groups.

To begin to address the issues of staff training, we must first better understand the nature of the learning that is necessary, in relation to both content and format. One might think of learning about technology as a several stage process: (a) learning what the technology is; (b) learning how the technology can be used; and (c) applying the technology to, and even changing, the learning process. The most important level of understanding occurs in this latter stage. One might think of this third stage of learning as if it were behind a window with the blinds drawn. Until the blinds are opened, until one has a good understanding of the what and the how of technology, it is difficult to understand how technology can enhance the learning process and can really make a difference for students.

Training needs to address all three of these stages. Practitioners need to increase their knowledge base about technology and be able to make sense of this information. They also need plenty of opportunity to explore what the technology can do and how to apply it to instruction, through experience-based and hands-on training. Beyond this, they need time to play and experiment with the technology. The most effective training appears to utilize a combination of structured activities and individualized exploration for accomplishing these goals.

Policymakers at both the state and federal levels have a role to play in increasing the availability of high quality technology training. Greater leadership must be exerted at the state level, by state directors and state literacy resource center directors. They must first lead by example, and if not already using the technology for administrative purposes and electronic networking, they must get themselves educated and up to speed. This is the case for local organization and program administrators as well. Their leadership, support, and encouragement is crucial to effective technology implementation. State plans should include annual staff development plans as well as technology plans. Just as at the federal level, program proposals should be solicited that address technology integration, and any proposals that include purchase of technology should be required to address plans for staff development. The state literacy resource centers are the natural organizational entity to centralize technology information and to play a facilitative and catalytic role in the expansion of technology training for practitioners. Within each state, better assessment of the existent technology expertise in the field, better sharing of technology experience and information resources, and better collaborative planning for technology training is necessary. We must enhance the capacity of the states to provide technology training and assistance. In addition, we need to develop models for technology training that can be replicated. These models must combine increased knowledge with hands-on experimentation, and also place a strong emphasis on training the trainer and peer training and coaching. Federal policymakers should help to support the development, replication, and dissemination of these models.

In addition to funds needed for staff development, a major issue is the availability of time. As has been noted, the field of adult literacy is dominated by part-time professionals, many of whom are juggling more than one job. They have little time beyond their instructional hours to participate in staff development, and in many cases, they will not be paid for their time to participate in training. In addition to offering more hands-on group staff development opportunities, we also need to explore more individualized, portable types of training. Information and resources must become more accessible and more training resources need to be developed (e.g., practitioner guides, videotapes, and on-line assistance) to meet individual needs and schedules. Laptop computers should be explored as a vehicle for delivering individualized training at home. Practitioners should be encouraged to use them to explore and learn about technology at times that fit their own schedules and needs.

It is also time for practitioners to examine their own attitudes about professional development. While, it is true that policymakers must provide more leadership and resources and facil-

itate and encourage the delivery of high quality technology training, practitioners must become more directly involved as well. Lifelong learning must become more of a reality for all of us. Many adult literacy practitioners, just like their students, are technologically illiterate and are falling further behind in being prepared for today's workplace. They must begin to take greater personal initiative and responsibility for their own learning in this important area.

Additional opportunities exist for expanding the scope and effectiveness of technology implementation in the adult literacy field. Efforts must be made to improve the availability of high quality instructional software. Software developers must be encouraged to make available more software that is adult-oriented, relevant to the lives of adults, pedagogically challenging, developmentally appropriate, culturally sensitive, and affordable. Better quality software must be developed that addresses the learning needs and styles of specific populations like low level readers and ESL students. With increasing interest in the newer interactive technologies, more multimedia software that provides speech, graphics, and feedback should developed. Recognizing the limitations of the current marketplace for developers, federal and state policymakers have a role to play in (a) providing incentives for developers; (b) facilitating the development of partnerships and leveraging of resources among government, developers, the workplace, and funders; (c) facilitating the development of purchasing consortia; and (d) encouraging the appropriate re-purposing of software products developed for other uses. Developers and practitioners need to communicate more directly with each other so that products that are developed actually meet student needs. The development of more high quality, appropriate software will help to expand the use of technology in adult literacy, which will in turn help to expand the software market.

Greater use of electronic communications could help to unite this very fragmented field and enhance the level of quality and professionalization within the field. In order to gain the full benefits possible of on-line services and electronic networking, state and federal policymakers must become advocates, encouraging communication, data collection, and other activities on the network. Using the networks for instructional and staff development activities should be a priority of demonstration project funds. The capacity of the state literacy resource centers should be enhanced so that they are able to play a central coordinating and facilitating role in increasing and enhancing on-line communication and services.

The potential of distance education is only beginning to be tapped at all by the field of adult literacy.* Practitioners have so little familiarity with this area that they do not begin to see its potential for addressing the problems of the field. Given the limited instructional resources and the large numbers of potential unserved or underserved adult students, there is much to be done in exploring how distance education technologies can provide expanded learning opportunities for all adults. Federal and state policymakers, the private sector, and private funders should develop more collaborative partnerships to explore the untapped potential of this area for delivery of quality instruction.

Finally, it is likely that only when practitioners have become comfortable with the technology and familiar with what it can do that they will begin to fully understand the opportunities that are available for expanding and changing the learning process and teacher and student roles. By viewing themselves as adult learners, by better understanding their own learning process, and by exploring collaborative learning methods for their own learning, practitioners can truly begin to explore and understand the possibilities offered by technology and better understand their students' need for a shift to a new teaching and learning paradigm—the guide on the side rather than the sage on the stage. Technology offers us the chance to change our perspectives and approaches and to help make a greater difference in the lives of students.

* *In partnership with PBS and KET public television, NCAL is currently working on the first internal-based distance education project in adult education.*

References

Anderson, J. (1991). *Technology and adult literacy.* New York: Routledge.

Askov, E. (1985). *Adult literacy coursewcare development.* University Park: Pennsylvania State University, Institute for the Study of Adult Literacy.

Askov, E., & Turner, T. C. (1989). Using computers for teaching basic skills to adults. In *Lifelong Learning: An omnibus of practice and research, Vol. 12,* (No. 6).

Askov, E., & Clark, C. J. (1991). Using computers in adult literacy. *Journal of Reading, 34*(6), 434-437.

Bank Street College. (1993). *Survey of telecommunications usage in elementary and secondary education.* New York: Bank Street College, Center for Children and Technology.

Berterreix, J. L. (1990). Computers and literacy: The LABO project. In J. P. Hautecoeur (Ed.), *Alpha 90: Current research in literacy.* Hamburg, Germany: UNESCO Institute for Education.

Blanchard, J. (1990, Spring). Hyperapplications: Implications for reading and writing. In *Adult Literacy & Technology Newsletter.* Available through ERIC system.

Chisman, F. P. (1989). *Jump start: The federal role in adult literacy.* Southport, CT: Southport Institute for Policy Analysis.

Cross, K. P. (1988). *Adults as learners.* San Francisco: Jossey-Bass.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920.* New York: Teachers College Press.

D'Ignazio, F. (1992, October). Teaching, learning, and the transformation of knowledge. *The Computing Teacher,* 54-55.

Duffy, T., & Bowen, B. A. (1986). *Technology applications in adult literacy instruction.* Pittsburgh, PA: Carnegie Mellon University.

Fleischman, J., & Porter, D. (1993). *Shifting paradigms: technology and adult education.* Washington, DC: National Adult Education Professional Development Consortium, Inc.

Guellette, D.G. (Ed.). (1982). *Microcomputers for adult learning: Potential and perils.* Chicago: Follett.

Hopey, C. E., & Harvey-Morgan, J. (1995a). *Technology funding for adult literacy* (Practice Guide No. PG95-03). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

Hopey, C. E., & Harvey-Morgan, J. (1995b). *Technology planning for adult literacy* (Practice Guide No. PG95-02). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

Hopey, C. E., Rethemeyer, R. K.,& Elmore, J. (1995). *Making the right choices: Evaluating technology in adult literacy* (Practice Guide No. PG95-04). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

Knowles, M. (1973). *The adult learner: A neglected species.* Houston: Gulf Publishing Company.

Lovell, M. (1993). Technology: How is it used in programs? *Adult Learning,* January/February, 7-9.

Massachusetts Software Council (MSC). (1994). *The switched-on classroom: A technology planning guide for public schools in Massachusetts*. Boston: Massachusetts Software Council, Inc.

Meterhenry, W. C. (1982). Microcomputers and adult learning. *Adult Learning*. Chicago: Follett.

National Center on Adult Literacy (NCAL). (1995). *Adult literacy: The next generation* (Technical Report No. TR95-01). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

Nickse, R. S. (1981). *The case for use of micro computers in adult basic education* (prepared for the National Advisory Council on Adult Education.) West Springfield, MA: Massachusetts Dept. of Education.

Rethemeyer, R. K. (1995). *Joining the on-line community: An introduction for adult literacy* (Practice Guide No. PG95-05). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

Sivin-Kachala & Bialo,-Kachala, J. P., & Bialo, E. R. (1992, June). *Software for adult literacy: Scope, suitability, available sources of information, and implications for federal policy*. Contractor report prepared for the Office of Technology Assessment, Congress of the United States.

KET Enterprises. (1992). *The KET instructional video catalog*. Lexington, KY: Author.

Turner, T. C. (1988a). Using the computer for adult literacy instruction. *Journal of Reading, 31*(7), 643-647.

Turner, T. C. (1988b). An overview of computers in adult literacy programs. *Lifelong Learning, 11*(8), 9-12.

Turner, T. C. (1991). The global community: Education through technology. *Community Education Journal, 18*(3), 607.

Turner, T. C. (1993). *Literacy and machines: An overview of the use of technology in adult literacy programs* (Technical Report No. TR93-03). Philadelphia: University of Pennsylvania, National Center on Adult Literacy.

U.S. Congress, Office of Technology Assessment. (1993). *Adult literacy and new technologies: Tools for a lifetime* (OTA-SET-550). Washington, DC: U.S. Government Printing Office.

Young, M., Morgan, M., Fitzgerald, N. & Fleischman, H. (1994, May). *National Evaluation of Adult Education Programs. Final report* (draft). Arlington, VA: Development Associates, Inc.

Vace, N. N. (1984). Computers in adult education. *Lifelong Learning, 7*(6), 26-28.

Appendix

Tables

Table 1: Survey Respondents by Position/Title

Table 2: Literacy Programs by State

Table 3: Literacy Programs by Type of Organization

Table 4: Annual Budget for Adult Literacy Activities

Table 5: Average Number of Staff and Volunteers per Program

Table 6: Number Students Served per Year

Table 7: Literacy Programs by Locality

Table 8: Use of Low-End Technologies

Table 9: Extent of Computer Use

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Table 1

Survey Respondents by Position/Title
(N=509)

Position by Category	Frequency	Percentage
Adult Literacy Director/Coordinator	315	62%
Administrator/Supervisor	154	30%
Instructional Position	36	7%
Computer Position	4	1%

Table 2

Literacy Programs by State
(N=515)

State	Frequency	Percentage
California	138	27%
Delaware	23	4%
Illinois	60	12%
New York	60	12%
North Carolina	134	26%
Pennsylvania	100	19%

Table 3

Literacy Programs by Type of Organization
(N=514)

Rank	Organization	Frequency	Percentage
1	Public School/School District	168	33%
2	Community-Based Organization	93	18%
3	Community College	92	17%
4	Literacy Volunteer Organization	80	16%
5	Other	39	8%
6	Library	31	6%
7	Correctional Institution	11	2%

NOTE. *Other* organization includes government agencies, hospitals, housing authorities, industrial sites, labor union education centers, rehabilitation centers, vocational training centers, intermediate units, churches, and university outreach and extension.

Table 4

Annual Budget for Adult Literacy Activities
(N=510)

Budget Range	Frequency	Percentage
under $50,000	218	43%
$50,000–$100,000	81	16%
$100,000–$200,000	68	13%
$200,000–$500,000	90	18%
$500,000–$1,000,0000	28	5%
more than $1,000,000	25	5%

Table 5

Average Number of Staff and Volunteers per Program
(N=08)

Position	Full-Time Paid Mean	Part-Time Paid Mean	Volunteer Mean
Administrator/Coordinators	1.3	1.1	1.9
Instructors	1.9	12.8	1.1
Instructional Assistants	1.1	1.0	.4
Tutors	.4	.9	46.8

Table 6

Number Students Served per Year
(N=460)

Population	Mean	Standard Deviation	Frequency	Range
Total	1370.0	5,411.8	460	6–100,000
ABE	183.2	433.1	381	1–6,000
Pre-GED	262.3	1,247.2	341	1–21,000
GED/ASE	347.8	715.4	302	1–6,672
ESL	777.9	3,775.7	347	1–60,000
Career Related	191.3	644.6	114	1–5,084
Life-Skills	345.5	784.5	104	2–6,000
Family literacy	118.4	377.0	127	1–4,000
Workplace literacy	146.6	282.6	133	1–2,500
Other	823.3	2345.3	59	15–13,309

Table 7

Literacy Programs by Locality
(N=505)

Locality	Frequency	Percentage
Metropolitan area (over 1.5 million)	71	15%
Large city (250,000–1.5 million)	42	8%
Medium city (100,000–250,000)	87	17%
Small city (25,000–100,000)	170	34%
Municipality (10,000–25,000)	57	11%
Rural area (under 10,000)	78	15%

Table 8

Use of Low-End Technologies
(N=460)

Rank	Technology	Frequency	Percentage
1	VCR	380	83%
2	Audio tape player	360	78%
3	Overhead projector	248	54%
4	Video camera	121	26%
5	Broadcast television	100	22%
6	Hand held device	60	13%

Table 9

Extent of Computer Use
(N=515)

Extent	Frequency	Percentage
Do not use computers and do not plan to	36	7%
Do not use computers but would like to in the near future	70	14%
Limited use of computers, not planning to expand	31	6%
Limited use of computers, would like to expand	259	50%
Significant use of computers	119	23%

Table 10

Extent of Use by Organizational Type

Organization Type	No Use, Not Planning	No Use, Planning To Use	Limited Use, No Plan to Expand	Limited Use, Plan to Expand	Significant Use	Total
Community-Based Organizations (N=93)	3%	19%	8%	57%	13%	100%
Community Colleges (N=91)	2%	5%	4%	55%	33%	100%
Libraries (N=31)	0%	10%	16%	64%	10%	100%
Literacy Volunteer Agencies (N=40)	24%	9%	4%	52%	11%	100%
Public Schools (N=126)	3%	16%	6%	43%	32%	100%

Table 11

Extent of Use by Budget Size

Budget Size	No Use, Not Planning	No Use, Planning To Use	Limited Use, No Plan to Expand	Limited Use, Plan to Expand	Significant Use	Total
under $50,000 (N=217)	14%	22%	8%	43%	13%	100%
$50,000- $100,000 (N=68)	4%	11%	10%	58%	31%	100%
$100,000- $200,000 (N=68)	1%	7%	3%	58%	31%	100%
$200,000- $500,000 (N=90)	0%	6%	2%	52%	40%	100%
$500,000- $1,000,0000 (N=28)	0%	4%	4%	50%	42%	100%
more than $1,000,000 (N=24)	0%	4%	0%	58%	38%	100%

Table 12

Computer Technology Activities
(N=515)

Activities	Frequency	Percentage	N=
Administrative	422	82%	515
Instructional	342	67%	512
Assessment	157	31%	511
Networking	133	26%	513

Table 13

Activities by Organizational Type

Organization Type	Administrative	Instructional	Assessment	Networking
Community-Based Organizations (N=93)	84%	52%	17%	16%
Community Colleges (N=91)	89%	88%	40%	37%
Libraries (N=91)	87%	71%	32%	19%
Literacy Volunteer Agencies (N=79)	76%	44%	9%	30%
Public Schools (N=168)	83%	76%	43%	29%

Table 14

Activities by Budget Size

Budget Size	Administrative	Instructional	Assessment	Networking
under $50,000 (N=215)	67%	46%	17%	16%
$50,000- $100,000 (N=51)	88%	69%	28%	22%
$100,000- $200,000 (N=68)	93%	87%	39%	22%
$200,000- $500,000 (N=90)	99%	86%	44%	36%
$500,000- $1,000,0000 (N=28)	90%	89%	39%	57%
more than $1,000,000 (N=24)	100%	92%	83%	71%

Table 15

Initial Motivations for Using Technology
(N=386)

Response (1–5, 1 = Not Important, 5 = Very Important)	**Mean Rating of Importance**
Believed computers could positively affect student learning (N=407)	4.33
Believed computers could improve student participation and retention (N=410)	4.14
Introduced to computers through a professional activity (e.g., conference, workshop) (N=409)	2.97
Influenced by other literacy programs using computers (N=411)	2.85
Required or recommended by supervisor/other administrator(s) (N=404)	2.49
Required or recommended by a grant or funding source (N=408)	2.37

Table 16

Perceived Advantage of Computer Technology

Response (1–5, 1 = Not Important, 5 = Very Important)	Mean Rating of Importance
Provide students with immediate feedback (N=381)	4.24
Provide greater learning incentives for students (N=385)	4.17
Provide students with non-threatening feedback (N=382)	4.14
Allow students to learn at their own pace (N=385)	4.13
Increase student control over learning experience (N=384)	3.99
Improve quality of instruction (N=384)	3.83
Improve student retention (N=386)	3.78
Improve student recruitment and participation (N=385)	3.55
Increase speed adult learners advance to next level (N=377)	3.45
Increase the number of adult learners served by program (N=381)	3.20
Increase collaborative learning activities (e.g., group writing) (N=376)	2.96
Increase access to instruction by remote methods (N=364)	2.05

NOTE Instruction by remote methods is home instruction via laptop computer or remote instruction via computer network.

Table 17

Types of Software Used for Instruction
(N=377)

Rank	Software Type	Frequency	Percentage
1	Drill and practice	301	80%
2	Word-processing	267	70%
3	Tutorial	264	70%
4	Educational games	242	64%
5	Problem solving	177	47%
6	Digitized speech	98	26%
7	Interactive	82	22%
8	Databases	75	20%
9	Spreadsheets	74	20%
10	Desktop publishing	69	18%
11	Simulation	55	15%
12	Multimedia	53	14%
13	Authoring tools	40	11%

Table 18

Percent of Programs by the Percent of Learners Having Access to Computer Instruction
(N=377)

Percent of Adults Having Access to Computer Instruction	Number of Programs Offering Access	Percentage of Programs Offering Access
00% to 25%	227	60%
26% to 50%	63	17%
51% to 75%	26	7%
76% to 100%	54	16%

Table 19

Programs That Use Computers for Instruction: Instruction Hours per Week by Student Population

Student Population	1 or Fewer Hours	2-5 Hours	5-10 Hours	10 or more Hours	Total
ABE (N=278)	35%	54%	8%	3%	100%
Pre-GED (N=254)	34%	53%	9%	4%	100%
GED (N=231)	31%	55%	9%	5%	100%
ESL (N=249)	36%	54%	8%	2%	100%

Table 20

Programs That Use Computers for Instruction:
Instruction Hours per Week by Student Population and Organization Type

Student Population	1 or Fewer Hours	2-5 Hours	5-10 Hours	10 or more Hours	Total
Community-Based Organizations (N=54)	53%	43%	2%	2%	100%
Community Colleges (N=80)	24%	63%	11%	2%	100%
Libraries (N=24)	67%	30%	3%	0%	100%
Literacy Volunteer Agencies (N=40)	55%	40%	5%	0%	100%
Public Schools (N=126)	31%	53%	10%	6%	100%

Table 21

Programs That Use Computers for Instruction:
Instruction Hours per Week by Student Population and Budget Size

Student Population	1 or Fewer Hours	2-5 Hours	5-10 Hours	10 or more Hours	Total
under $50,000 (N=116)	45%	47%	5%	3%	100%
$50,000–$100,000 (N=61)	54%	33%	10%	3%	100%
$100,000–$200,000 (N=54)	41%	48%	9%	2%	100%
$200,000–$500,000 (N=74)	24%	62%	11%	3%	100%
$500,000–$1,000,0000 (N=23)	13%	74%	9%	4%	100%
more than $1,000,000 (N=23)	9%	83%	4%	4%	100%

Table 22

Access to Computer Instruction by Student Population

Student Level	Frequency	Percentage	N=
ABE Beginners	149	39%	381
ABE Intermediate	146	38%	381
GED/Diploma	102	45%	302
ESL	102	29%	347

Table 23

Providers of Training
(N=229)

Provider	Frequency	Percentage
Other Staff	167	73%
Product Vendors	95	41%
Outside Trainers	84	37%
Local College/University	8	3%

Table 24

Providers of Computer and Technical Support
(N=397)

Rank	Organization	Frequency	Percentage
1	Full-time staff member	124	31%
2	Part-time staff member	90	23%
3	Outside consultant	89	22%
4	Full-time technology specialist	63	16%
5	Volunteer	60	15%
6	No one	58	15%
7	Part-time technology specialist	44	11%
8	Vendor	15	4%

Table 25

Provide Formal Technology Training by Organizations

Organizations	Frequency	Percentage
Community-Based Organization (N=69)	29	42%
Community College (N=87)	53	61%
Library (N=26)	12	46%
Literacy Volunteer Agency (N=46)	20	43%
Public Schools (N=143)	93	65%

Table 26

Nature of Formal Training
(N=175)

Nature of Training	Frequency	Percentage
Seminar Format	160	91%
Hands-On	15	8%

Table 27

Provide Formal Technology Training by Budget Size

Organizations	Frequency	Precentage Offering Training
under $50,000 (N=142)	69	49%
$50,000–$100,000 (N=66)	32	48%
$100,000– $200,000 (N=60)	33	55%
$200,000–$500,000 (N=82)	54	66%
$500,000–$1,000,0000 (N=26)	18	69%
more than $1,000,000 (N=24)	20	83%

Table 28

Most Common Local Area Networking (LAN) Activities
(N=155)

Rank	LAN Activity	Frequency	Percentage
1	E-mail	95	61%
2	Student record keeping	89	57%
3	Instruction	57	37%
4	Databases	52	33%
5	Courseware access	51	33%
6	File sharing	44	28%
7	Storage of student assignments	44	28%
8	On-line conferencing	35	23%
9	Consumer/job information	24	15%
10	Group writing	10	6%

Table 29

Types of On-Line Networking Services Being Used
(N=125)

Rank	On-Line Service	Frequency	Percentage
1	OTAN	48	38%
2	America On-Line	39	31%
3	Internet Direct-Access	32	26%
4	CompuServe	5	4%
5	Applelink	3	2%
6	Prodigy	2	1%

Table 30

Most Common On-Line Networking Activities
(N=125)

Rank	On-Line Activity	Frequency	Percentage
1	E-mail	85	68%
2	Bulletin Boards	58	46%
3	Gopher	13	10%
4	Telenet	9	7%
5	File Transfer (FTP)	4	3%
6	WAIS	4	3%
7	WWW–Mosaic	1	1%

Table 31

Inventory of Computers
(N=413)

Computer Type	Frequency of Programs Using Computer Type	Percentage of Programs Using Computer Type	Average Number of Computers Per Program*
Apple II, IIe, and gs	193	47%	9.9
IBM or IBM-compatible 386/486	187	45%	12.2
IBM or IBM-compatible PC or PC jr.	173	42%	11.7
Apple Macintosh LC and Mac II	125	30%	7.7
Apple Macintosh Plus, SE, Classic	112	27%	7.1
IBM or IBM-compatible XT/AT	104	25%	8.2
Apple Macintosh Centris or Quadra	22	5%	2.3

NOTE. The average number of computers per program is an averaged by the frequency of programs using the computer type.

Table 32

Computer Operating Systems Used
(N=386)

Computer Operating System	Frequency	Percentage
DOS	305	79%
Windows	192	50%
Apple IIe System	130	34%
Macintosh System 7	93	24%
Macintosh System 6	76	20%
OS/2	10	3%
UNIX	9	2%

Table 33

The Use of New Computer Technologies
(N=428)

Rank	On-Line Activity	Frequency	Percentage
1	E-mail	85	68%
1	VGA or SVGA Monitors	123	29%
2	CD-ROM	111	26%
3	Modem	96	22%
4	Scanner	52	12%
5	Digital sound tools	51	12%
6	Video laser disc	47	11%
7	Voice/speech recognition	31	7%
8	Touch sensitive screens	25	6%

Table 34

Three-Year Funding Cycle for Technology
(N=338)

	Last Year		Current Year		Next Year	
	Mean	Deviation	Mean	Deviation	Mean	Deviation
Hardware	$8,505.4	$25,455.5	$6,628.4	$22,653.0	$2,983.3	$10,605.6
Software	$3,446.1	$9,865.6	$2,670.8	$8,027.7	$1,465.5	$4,938.7

Table 35

Sources of Additional Funds
(N=209)

Additional Source	Frequency	Percentage
State and Local Grants	113	54%
Federal Grants	89	43%
Corporate Donations	51	24%
Private Foundations	38	18%
Fundraising Events	36	17%
Community Agencies	24	11%

Table 36

Decision-Makers in the Technology Purchasing Process
(N= 404)

Decision-Makers	Frequency	Percentage
Program Director	288	71%
Instructors	178	44%
Technology Coordinator	140	35%
Supervisors	137	34%
Advisory Board	74	18%
Other Staff	55	14%
Funding Agency	45	11%
Students	26	6%

Table 37

Obstacles That Inhibit the Expansion of Technology

	Non-Users of Technology		Users of Technology	
Response (1–3, 1 = Not Important, 3 = Very Important)	**Mean**	**N=**	**Mean**	**N=**
Lack of financial resources	2.72	83	2.78	420
Lack of adequate training for staff/instructors	1.99	79	1.84	408
Federal/state policies constrain the purchase of technology	1.91	69	1.67	403
Lack of time for staff to learn how to use computers	1.91	78	1.80	406
Additional staff required	1.76	70	1.69	399
Have inadequate information about use of computers	1.75	76	1.59	409
Believe traditional methods of instruction more effective	1.67	79	**	**
Too many choices, hard to make decisions	1.42	74	1.33	401
Do not believe in the use of computers	1.38	77	**	**
Staff/instructors resistant to using computers	1.38	76	1.42	404

NOTE: Questions with the ** were not asked to non-technology users.

Table 38

Assistance Needed to Expand the Use of Technology

	Non-Users of Technology		Users of Technology	
Response (1–3, 1 = Not Important, 3 = Very Important)	**Mean**	**N=**	**Mean**	**N=**
Training on the use of computer technology	2.25	72	2.26	405
Information on available technologies and their use for adult literacy	2.24	72	2.42	407
Software/hardware evaluations and reviews	2.10	72	2.42	405
Research on the effectiveness of computer technology in adult literacy instruction	2.03	71	2.10	404
A computer technology demonstration center	1.99	70	2.12	405
An adult literacy on-line computer network	1.91	70	2.12	397

Figure 1

Percentage of Programs That Offer Instruction at More Than One Location
(N=515)

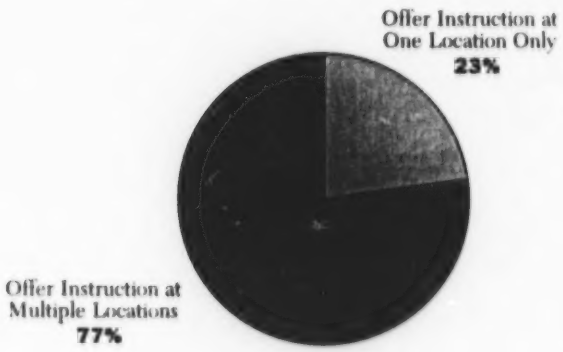

Figure 2

Percentage of Programs Using an Integrated Learning System
(N=390)

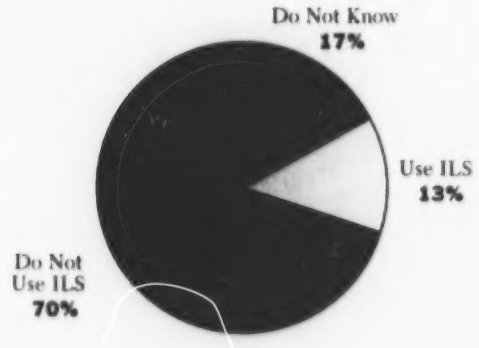

Figure 3

Percentage of Programs That Developed Their Own Software
(N=413)

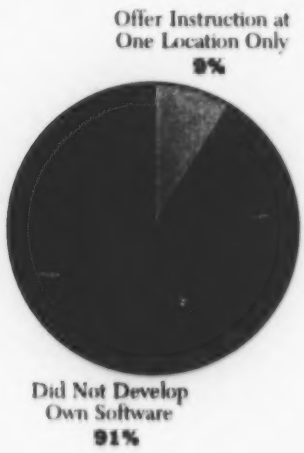

Figure 4

Percentage of Programs That Offer Computer Instruction to Students by the Number of Hours per Student, per Week
(N=356)

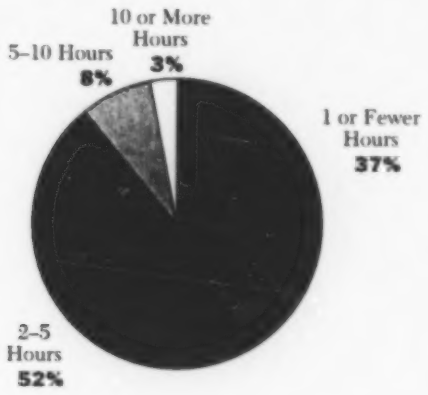

Figure 5

Percentage of Programs That Offer Computer Instruction Outside of Regular Instructional Hours
(N=384)

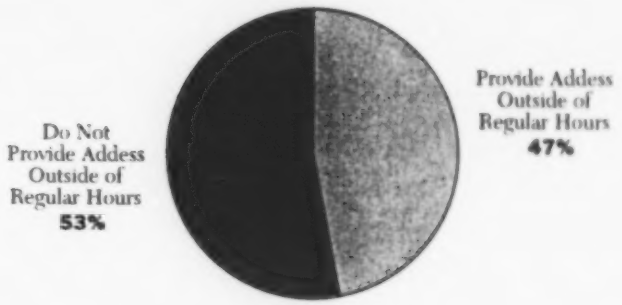

Figure 6

Percentage of Programs That Offer Formal Technology Training to Staff and Instructors
(N=402)

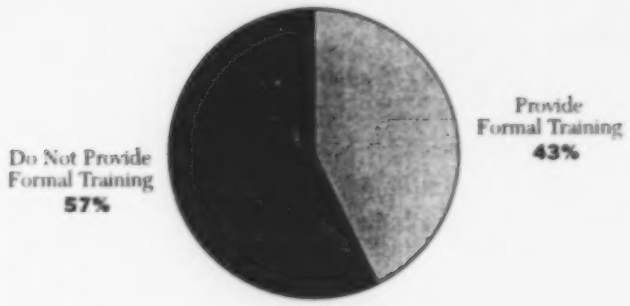

Figure 7

Percentage of Programs That Use Networking
(N=419)

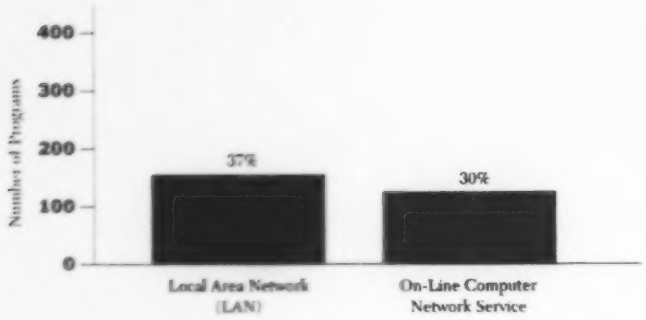

Figure 8

Percentage of Programs That Use Laptops for Instruction
(N=417)

Figure 9
Sources of Financial Support for Technology